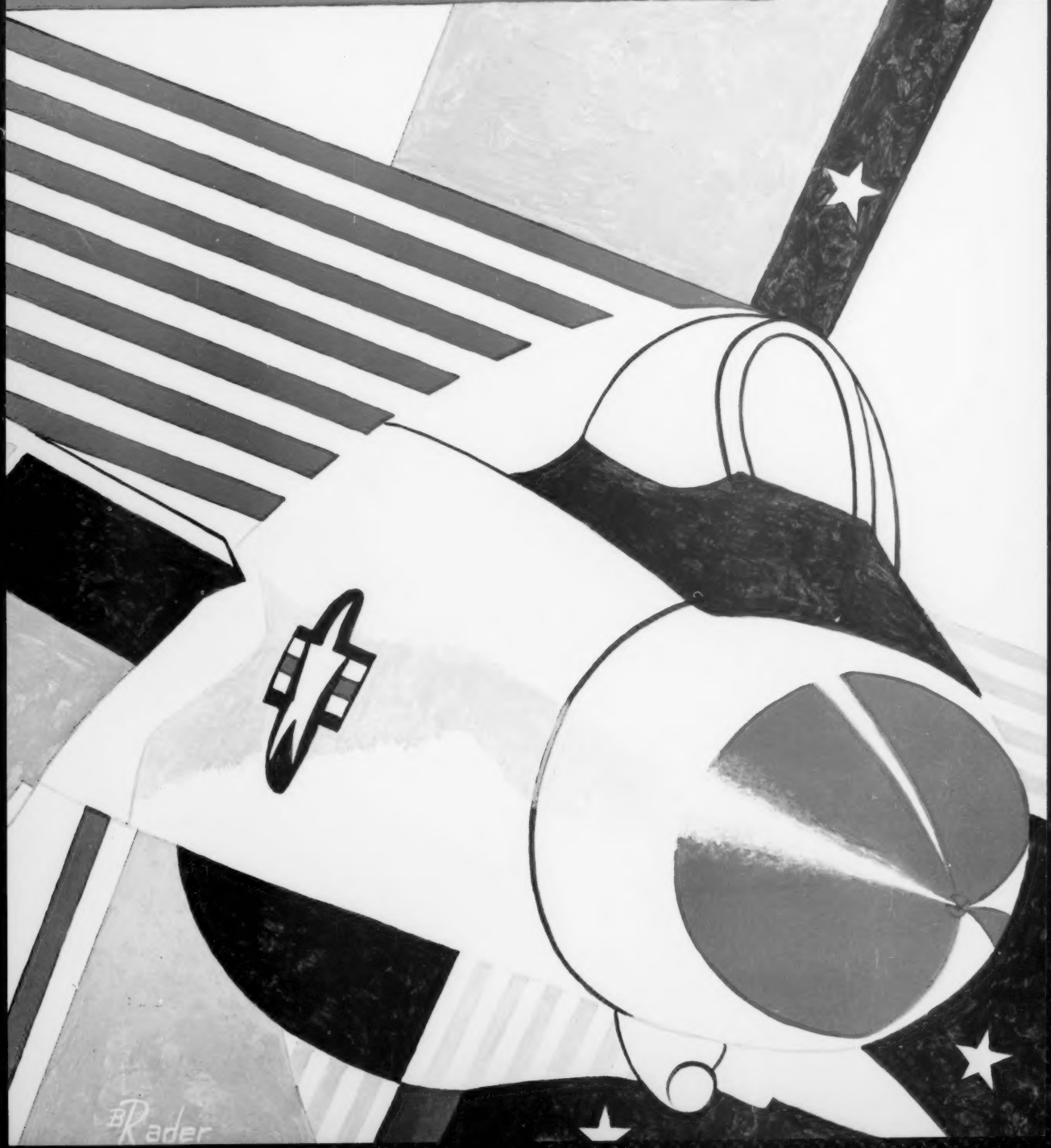
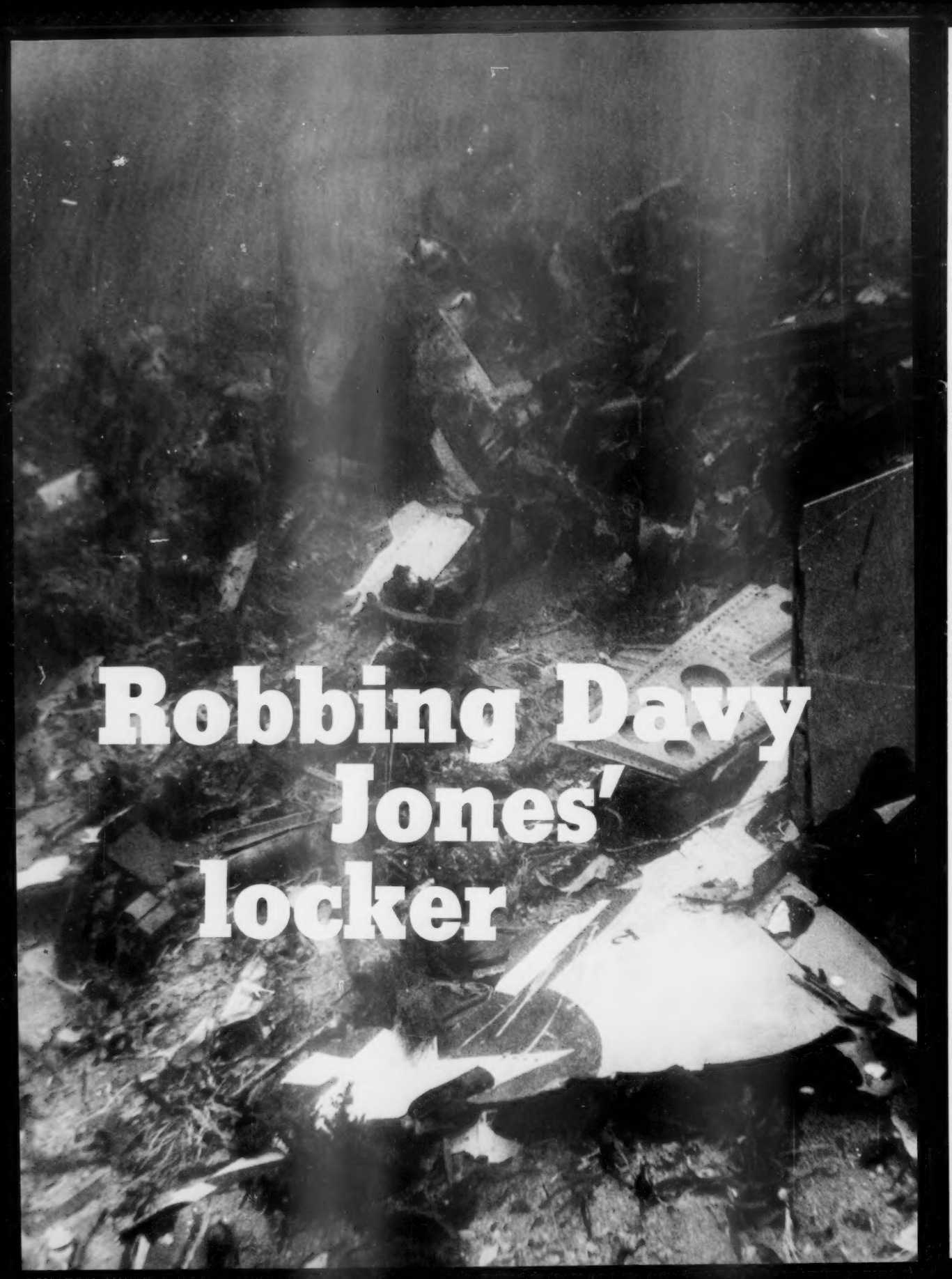
approach

JULY 1977 THE NAVAL AVIATION SAFETY REVIEW




Robbing Davy Jones' locker

Salvaging naval aircraft lost at sea

By Richard P. Shipman
Naval Safety Center

FOR almost 2 months, the team of salvage experts had been attempting to recover an elusive F-14 *Tomcat* that had plunged from the deck of USS JOHN F. KENNEDY. With the supersecret Phoenix missile and its AWG/9 radar control system aboard, vital military information could fall into foreign hands if the wreckage was left unsalvaged. Furthermore, the AMB (accident mishap board) wanted to recover the wreckage to establish the cause of the runaway engine that had propelled the F-14 off the deck. The F-14 *had* to be recovered!

The search effort had been hampered from the first by the elements. The *Tomcat* went down in relatively deep water (1900 feet) in an area of the North Atlantic known for its high winds and heavy seas. Often encountering 35- to 45-knot winds and seas in excess of 12 feet, navigational, search, and recovery efforts had been severely complicated. In addition to the elements, equipment failures plagued the crew.

Eventually, the *Tomcat* was located, but recovery proved even more difficult than detection. Lines attached to the aircraft broke under the strain of the heaving ship. A specially fabricated steel net designed to snare the F-14 proved too weak to hold it. Aircraft attachment points broke loose from the repeated stress placed upon them by the efforts to raise the aircraft. Twice the fighter was raised near the surface; twice it broke free and returned to the ocean floor.

Finally, almost 2 months after the crash, salvage crews were able to snag the aircraft using span wire towed between two ships. With the *Tomcat* snagged and in tow, the ships proceeded to shallow water where the sea finally and reluctantly relinquished the *Tomcat.*

This remarkable recovery is indicative of what can be done in underwater salvage of downed aircraft. And, increasingly, the Navy has been attempting to recover aircraft lost at sea. Obviously, recovery of aircraft wreckage is imperative to any accident investigation if any doubt exists as to the cause of the accident. Consider the following accidents that would have remained mysteries forever had the wreckage not been salvaged:

Underwater visibility is an important factor in recovery operations. Conditions can range from excellent, as in this photo, to as limited as 1 to 2 feet.

- An F-4J pitched up violently and unexpectedly during an ACM engagement. It subsequently departed controlled flight and crashed off the coast of North Carolina. An intensive salvage effort produced the wreckage, specifically, the tail section. As a result of the wreckage investigation, a discrepancy was found in the horizontal stabilizer (stabilator) that had caused the aircraft to go out of control. Thus a serious problem that had only been suspected in previous accidents was confirmed and corrected.

- An RA-5C crashed off the coast of Florida during a routine training flight at 13,000 feet. Following an electrical failure, both crewmen ejected in level flight. Recovery of the wreckage revealed an inflight fire in the bomb bay area.

- An F-4 experienced a firewarning light on the port engine. The pilot shut the engine down and headed for a nearby airfield. Enroute, the controls seized and the crew ejected. Extensive effort by divers and salvage personnel recovered the port engine and identified the cause – a leaking fuel nozzle. It had sprayed jet fuel into the engine bay, starting a fire that burned through hydraulic lines, control linkages, and eventually caused the crash. Another "undetermined" accident was solved, resulting in action to prevent similar mishaps.

These are but a few examples of the value of recovering aircraft lost at sea. Clearly, underwater salvage is an important aspect of aircraft accident investigation today and will continue to be in the future.

So, what is involved in a salvage operation? What is the squadron's role in the process, and what can the squadron do to make a more effective salvage? This article will attempt to answer these questions by giving an overview of salvage operations.

The salvage process is not easy. Nor is it cheap. But the state of the art today is such that the Navy can recover aircraft lost in thousands of feet of water, if the importance of the operation demands it.

That's the key word – importance. Obviously, it would be ideal to salvage every aircraft that crashed at sea, but that's not financially realistic. Therefore, the first step in any underwater recovery effort is to decide if the value of the wreckage is worth the recovery cost. This judgment is based on several factors:

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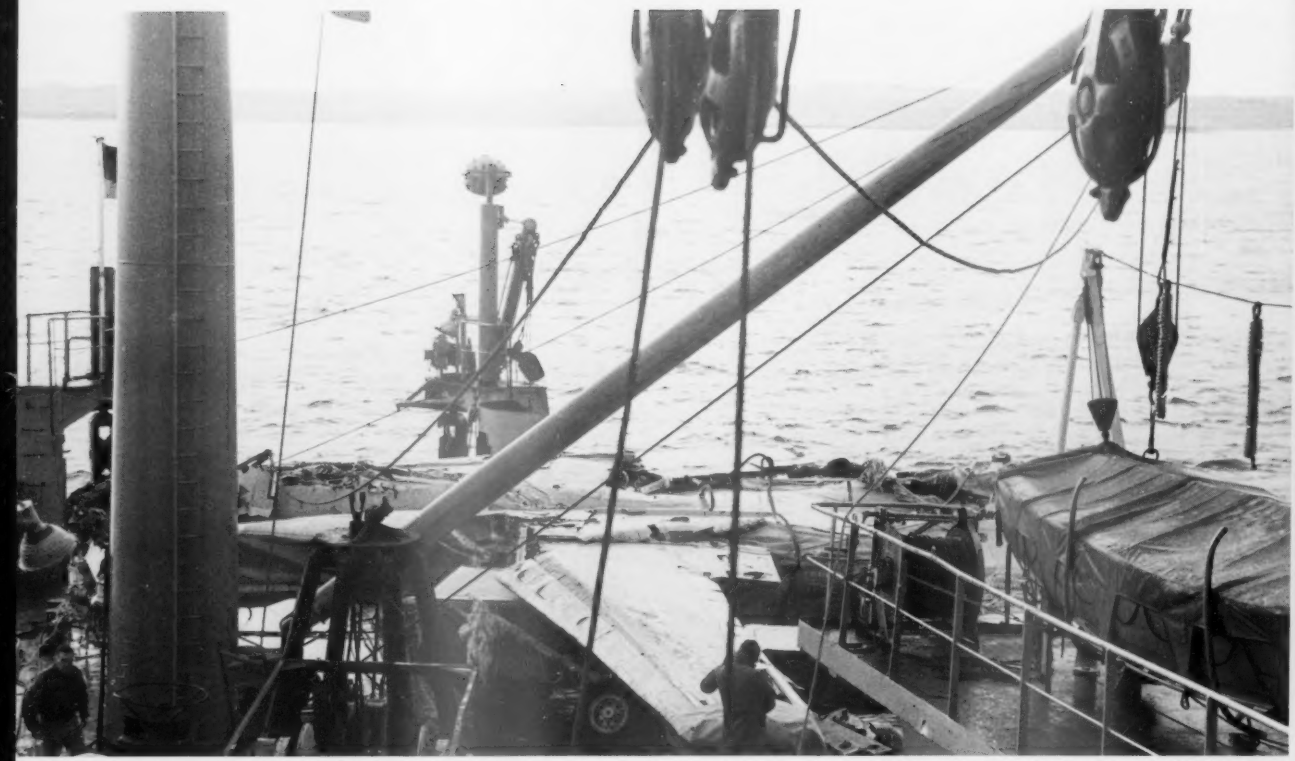

The recovery of an F-14 *Tomcat* from 1900 feet of water during adverse weather conditions demonstrates the salvage capability that exists today.

- The importance of finding a cause. Accidents which appear to have widespread implications have higher priority than suspected isolated problems.
- Extent of information available. If the mishap board can obtain statements from surviving crewmembers and/or witnesses, the wreckage may not be necessary to identify a probable or definite cause. Salvage in this situation would be redundant and unnecessary. The less information available, the more important the salvage.
- Type of aircraft involved. It would be more important for the Navy to find and fix material failures in an F-14 or S-3 than in the familiar T-28. New aircraft typically have problems that need ironing out, so identification of these problems early in the aircraft's development is critical.
- Accessibility of the wreckage. Although the capability exists to recover aircraft lost in deep water, the deeper the water, the more difficult and expensive the salvage.

In reality, the decision to salvage is made by several commands. If the squadron decides it wants to salvage an aircraft, it passes this request, along with the justification, to the appropriate type commander (controlling custodian). The TYCOM and the Naval Safety Center then decide on the potential gain from salvage, and if considered warranted, a request for salvage assistance is sent by message to the Commander, Naval Sea Systems Command, Supervisor of Salvage branch. These procedures are contained in OPNAVINST 3750.6K, para 405(c).

The SupSalv (Supervisor of Salvage) possesses the expertise for the salvage effort. He has available to him Navy submarine rescue and other diving ships (ATF, ASR, ARS), harbor clearance units, Navy divers and swimmers, as well as specialized civilian contractors. An expert from SupSalv will be assigned to each salvage effort. He will coordinate what assets are needed and be in charge of the recovery effort.

The SupSalv coordinator will start the typical recovery effort by meeting with members of the accident board to get as much information as possible before start of operations. Things he will want to know include:

- Unique aircraft characteristics (attachment points for lifting lines, special hazards, etc.).
- Course, speed, and angle of impact.
- Time of crash.
- Source of fixes, and type of fixes used to mark wreckage.
- Hazardous stores/cargo, status of ejection seat.

The F-14 is hauled aboard the commercial ship TAURUS. The hoisting phase of wreckage recovery can be very difficult due to the weight of waterlogged airframes.

USS SHAKORI (ATF 162), a fleet ocean tug, is one type of ship used commonly in salvage operations.

- Weather conditions at time of crash and subsequent.
- Water depth, type currents.

Once this and all other pertinent background information has been analyzed, the operation begins. The salvage of wreckage can usually be divided into two separate operations: search and location of wreckage and recovery of wreckage.

To the uninitiated, location of the wreckage may not appear to be a big problem. But it is! A precise fix is usually not available to mark the exact location where the aircraft entered the water. Even if a good fix can be obtained, water acts on an airfoil just like air, and an aircraft is likely to "sail" some distance from where it went in. Add to this underwater currents and vastness of the oceans, and location is indeed a problem.

Several search systems are available, among them hull-mounted sonars, submarines, television systems, and swimmers/divers. The most effective and widely used search system is the side-scanning towed sonar unit. Development of this piece of equipment has been one of the primary reasons for the increasing success of salvage operations.

The side-scanning sonar is a cylindrical "fish" which is attached to a tow line from a towing vessel. The sonar is usually towed close to the bottom and sends out short, acoustic, fan-shaped pulses that bounce off objects. The information is relayed to recorders onboard the towing ship, and a graphic portrayal of the outlined article is presented.

The main limitations of the towed sonar are water depth and bottom topography. Presently, towed sonars are limited by the length of cable that can be attached, effectively restricting operations to water depths no greater than 6000 feet. Bottom topography that is extremely rough will hinder use of the sonar due to the many returns that make identifying a single target very difficult. While substitute search methods are available, they are either much more expensive or considerably less effective. Hull-mounted sonar is not precise enough to define aircraft debris. Submarines and more exotic salvage vehicles such as the Alcoa *Seaprobe* are extremely expensive. Television and swimmers/divers are very limited in the range they can search. Thus, towed sonar is the mainstay of search efforts. Fortunately, sonar can be used in most salvage efforts.

Once an object has been outlined by the towed sonar, positive visual identification is usually required to ensure that it is the desired wreckage. To accomplish this, TV

cameras, divers, or more sophisticated vehicles such as the CURV III (cable-controlled underwater recovery vehicle), Deep Drone, and NR-1, a nuclear-powered, ocean research submarine, can be used. In the search for the F-14, the NR-1 was used to positively identify the *Tomcat* once it had been located by the side-scan sonar.

Critical to the success of the sonar search is a precision navigation system. Since the sonar can cover only a limited width at any one time (usually 150 meters on either side), it is necessary to go back and forth over the search area in the manner of mowing a lawn. Since no freshly cut grass exists to mark the area already searched, a precision navigation system must be used to keep track of the search lanes. Also, the precision navigation unit is needed to fix the wreckage location exactly, once it has been located. This frees the search ship to return to Homebase and prepare for the recovery phase of the operation.

Once the wreckage has been located, identified, and marked, the recovery phase begins. Here again, the salvage coordinator has a variety of vehicles to use depending on the nature of the recovery. Factors to be considered include:

- Overall object size, weight, construction, and condition of wreckage.
- Final distance offshore.
- Average weather and sea state.
- Water temperature.
- Type bottom and depth of water.

The variety of equipment that can be used is illustrated by the following actual recoveries: An F-4J was recovered from Subic Bay by USS GRASP, an ARS (salvage ship). An Air Force F-106 was recovered with a YSD, a self-propelled floating crane; and the F-14 recovery used an ATF (Fleet tug) in addition to several commercial salvage vessels of other nations. Other common assets available to SupSalv include ASR (submarine rescue ships) and ATS (salvage towing ships).

Typical recovery operations involve sending swimmers/divers down to the wreckage to attach nets or lines to the debris. Nets are used if the wreckage is scattered and small, while lines are used for large intact parts. Heavy-duty winches and cranes then haul the parts to the surface for analysis.

Perhaps it is easier to visualize the overall salvage procedure by reviewing an actual operation. On 6 August 1976, an F-4N attached to VF-101 Det Key West crashed in the Gulf of Mexico, northwest of Key West. The fighter had been engaged in one-on-one tactics. Following the third engagement, the RIO of the accident aircraft broadcast

The CURV (cable-controlled underwater recovery vehicle) can be used to verify wreckage located by the side-scan sonar.

"knock it off," and the lead aircraft acknowledged while rolling into an easy turn to expedite the rendezvous for return to base. Instead of joining, however, the wingman began a descent from approximately 10,000 feet. As his speed increased and his nose attitude steepened, the lead called "watch your altitude!" The aircraft failed to pull out. The RIO initiated ejection just prior to water impact, but neither crewmember survived the accident.

With no survivors and virtually no information to shed light on the accident cause, recovery of the wreckage was imperative. Since the aircraft was not out of control, it was conceivable that some aircraft malfunction existed that prevented the crew from recovering. A problem of this nature would have major ramifications for the entire *Phantom* community, both Navy and Air Force. The aircraft had to be recovered.

The lead aircraft had marked a TACAN fix where he observed the aircraft to go in, and Navy and Coast Guard ships positioned a moored barrel near floating debris. The depth of water in the area was approximately 100 feet. Local EOD (Explosive Ordnance Disposal) divers initiated a search, but almost immediately terminated due to large sharks in the search vicinity.

When the AMB determined that salvage was beyond the capability of the squadron, the senior member of the board contacted NAVAIRLANT and the Naval Safety Center for assistance. The board stressed the importance of the recovery; AIRLANT and NAVSAFECEN concurred. The decision was made to go ahead. On Friday, 13 August, a message was sent to the Supervisor of Salvage requesting salvage assistance.

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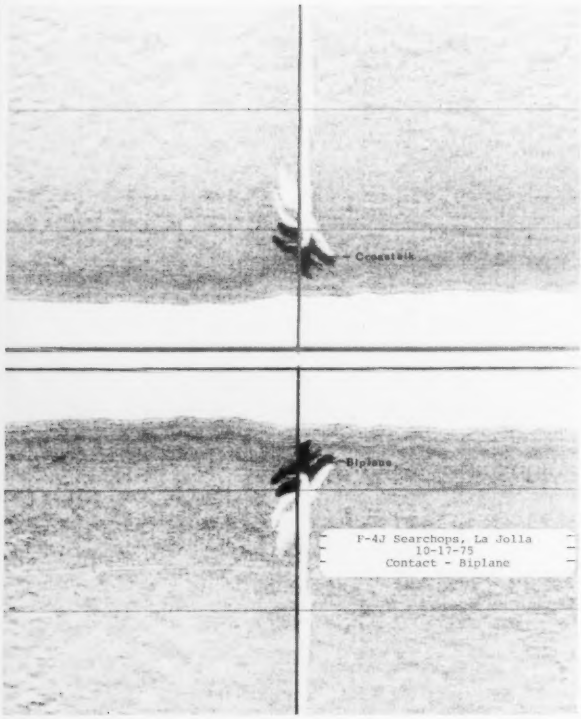


Example of side-scan sonar trace. An old WWI biplane was traced during search for an F-4J.

SupSalv assigned LCDR W. J. Tageson, USN, as the salvage representative for the operation. Simultaneously, Seaward, Inc., a civilian firm and the prime Navy contractor for search and recovery tasks, was alerted to furnish a search team. Seaward's representative on the accident was Bob Kutzleb, Vice President/Operations. He is one of the acknowledged experts in the underwater recoveries and has participated in many operations, including the remarkable F-14 recovery. Kutzleb and his firm were responsible in this operation for setting up the navigation system and providing the sonar unit.

LCDR Tageson, Bob Kutzleb, and VF-101 personnel met on 17 August to conduct a preoperation brief. Positioning data, accident background information, witness statements, and equipment arrangements were thoroughly discussed. The recovery team purchased nautical charts of the search area and commenced plotting fix points.

While the search and recovery team was involved in its briefing, the USS ESCAPE (ARS 6) had been selected as the search and recovery platform for the recovery and was en route from Mayport, FL. It arrived 19 August, and the sonar team and navigation equipment were loaded aboard.

With the navigation equipment calibrated and the sonar unit checked out, ESCAPE got underway on Saturday, 21 August. By 2000, the ship was in the crash vicinity, and the sonar "fish" was launched to commence the search pattern. A small contact appeared shortly thereafter, and while it appeared too small to be the aircraft, the team decided to investigate further in the event this contact might be a portion of the wreckage.

Divers were put over the side to search out the contacts. They located scattered wreckage of an old shrimp trawler – but no aircraft. The dive boat was recovered, and the search pattern continued.

After searching continually for the next 2 days, a good contact appeared at 0500 Tuesday morning. Divers again went over the side to verify the finding. They confirmed that it was the F-4N – engines, cockpit, and other debris.

The recovery ship established a two-point moor over the wreckage, and recovery operations began. The divers were able to use SCUBA equipment due to the shallow water (less than 100 feet). Had the water been deeper, the divers would have been forced to go to an air or helium/air breathing rig, requiring hardhat dives. The reduced mobility and decompression requirements of the hardhat dives necessarily slow a recovery effort.

Raising the parts presented no particular problems, and by 27 August, nearly all significant aircraft components had been recovered. The search crew disbanded.

As a result of this successful salvage, the aircraft mishap board was able to determine:

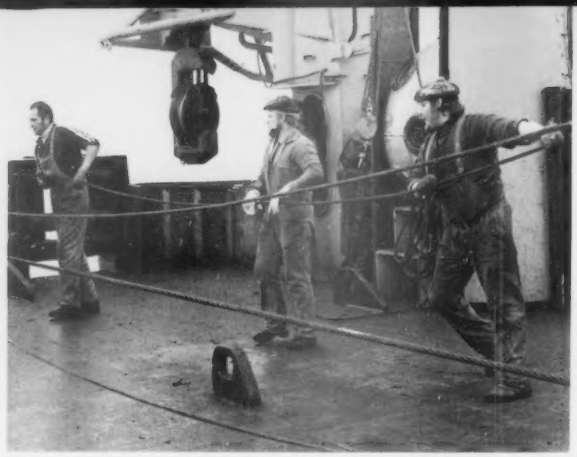
- The aircraft was in balanced flight when it crashed, approximately 65 degrees nose low, 230 degrees right roll, airspeed in excess of 500 KIAS.
- No airframe structural failures occurred prior to impact.
- Primary electrical power was available until impact.
- Both engines were operating at MRT prior to impact.
- Stabilator control cylinders revealed that the pilot had made no conscious effort to recover from the dive.
- No ejection was attempted by the pilot.

Based on this information, the board concluded that pilot incapacitation was the probable cause of the accident. No further action was necessary in the F-4 community, as no aircraft problems were discovered.

While this was one example of a salvage operation, it is not necessarily typical. Indeed, experts in the field will tell you there is no such thing as a typical salvage effort. Each one seems to present new and different problems and circumstances. Nevertheless, there are certain things that squadrons can do in every accident at sea where a salvage effort may be contemplated.

Perhaps the most important thing is to get as accurate a fix as possible to mark the crash location. TACAN fixes are the first and most obvious method. While these are better

SCUBA divers can be used to identify wreckage and attach hoisting cables if water depth is less than 100 feet.



Civilian contract ships are sometimes used in salvage operations that require special equipment. German sailors from M.V. TAURUS play out hoisting cable in an attempt to raise the F-14.

than nothing, they do have limitations. When slant range distortion, aircraft movement, and equipment accuracy are considered, TACAN does not really provide the degree of accuracy desirable to pinpoint wreckage.

So, try to back up and supplement any TACAN fixes with other techniques such as marker buoys, ship navigation fixes (LORAN, SINS), inertial plots from aircraft so equipped, and any other methods possible.

The best solution to the location problem would be to have all naval aircraft equipped with acoustic pingers. Formally called acoustic locators, the pinger is a small beacon transmitter about 4 inches long which weighs about 9 ounces. It is attached to the aircraft structural frame and is designed to survive severe crash conditions and commence operating upon water entry. The pinger sends out a signal which can be used to home in on. These pingers are currently installed in test and evaluation aircraft and are being installed in CONUS-based F-14 and A-7E aircraft. CNO has authorized installation in other service aircraft, and this will be implemented in the future as funds become available and the engineering changes are prepared and promulgated. For more information on the pingers, see MAY '75 APPROACH ("Unlocking Davy Jones' Locker").

While marking the wreckage is probably the most important thing the squadron can do, there are other functions for members of the AMB to perform in a salvage effort. Search and recovery teams rely on the squadron's expertise to gain information they need about the aircraft. Be ready to give them such information as aircraft weight, strong points for lifting, hazardous areas, and similar matters. You may be asked to provide a standard lifting harness if the aircraft is relatively intact and upright.

It's also important that a member of the mishap board be onboard during the wreckage search and recovery. His expertise will be needed for identification of the aircraft parts and other onsite advice. He also should view the wreckage as soon as possible when it is onboard, and if feasible, make arrangements for a freshwater washdown of the recovered parts. One word of caution. If you sometimes think flying is "hours and hours of sheer boredom," wait until you experience a sonar search effort when the wreckage location is not too well pinpointed!

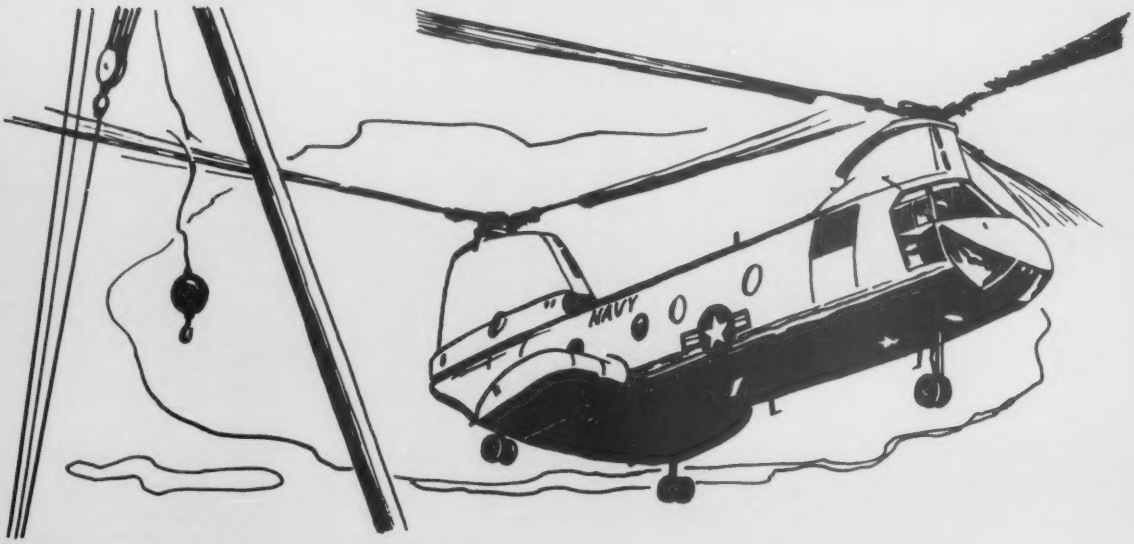
Laborious or not, the salvage of naval aircraft will continue to assume increased importance in the future. As aircraft become more expensive and scarce, it becomes even more important that every crash be fully investigated and a cause revealed so that future accidents can be prevented. The future of the Navy's readiness and the safety of naval aircrews demand it. ◄

CORRECTION

In the MAY '77 issue ("A Shaky Design"), we incorrectly stated that the proper procedure to request modification of aircraft is to submit an aircraft discrepancy report (OPNAV Form 4970/48).

The NAMP Manual, Volume II, Chapter 7, para 716 describes the correct procedures for "Modification of Aeronautical Equipment." Also, NAVAIR 5215.10 contains "Policies and Procedures for Rapid Action Minor Engineering Changes."

" . . . the reason you were waved off is because the loading folks want you to land facing aft, to facilitate loading that big container. Recommend that the right-seat pilot shoot the approach. The LSE is in position aft on the port side of the flight deck, winds and seas are calm, altimeter 30.00. You have a green deck."



The HAC couldn't hack it

THE CH-46 aircraft commander, upon receipt of the above transmission, positioned the helicopter as requested. The helo was to be landed on deck, facing aft, from a right-seat approach, from sideward flight, over the starboard edge of the flight deck.

Now, you'd think that any self-respecting helicopter pilot would have just one train of thought going through his head. Like: All the garbage and obstructions are behind me. I won't be able to see anything. I know I only have 36-foot clearance for the aft blades, so I'll fudge a bit out over the water. If I have to back down a skosh or do a pedal turn, I'll do it right on the aft deck edge. I know nothing is growing out of the water, and there aren't any obstructions near the blunt end of the boat.

Squadron policy permitted reverse-direction landings on logistics support ships to facilitate loading of outsized internal cargo. Such operations are not so frequent as to preclude special planning and accommodation when necessary. Usually, this procedure has been used strictly as convenience for the cargo handlers rather than to expedite a replenishment evolution.

The blade tip clearance to the nearest obstruction is 36 feet aboard AE and 42-50 feet, respectively, aboard AFS and AOE ships. It would appear those clearances are sufficient to permit reverse-direction landings to be executed safely.

Well, friends, appearances are deceiving, and safe execution of this maneuver is something else. The HAC air-taxied at an angle from midships direction toward the stern (moving sideward and forward). His blades severed a ¾-inch steel cable attached to the starboard 10-ton boom, causing a 400-pound steel ball to strike the flight deck. The HAC landed and shut down.

No one was injured in this close call, and only limited damage to the helicopter resulted. The HAC erred in not ensuring that he was free of obstructions before crossing the deck edge. He saw unauthorized persons on the flight deck and requested they be cleared out of the area. They were run off. However, when the LSE signaled the pilot to come forward (further aft over the flight deck), the HAC did not respond.

Reverse-direction landings are not normal evolutions. They must be approached and executed with finesse and extreme caution. ◄

Don't forget the "E" in your safety program

By LCDR J. F. Wagner
VAW-125 ASO

THE list of instructions concerning aviation safety is long. Safety of flight is discussed during preflight briefs, AOMs, and especially during safety standdowns. Safety officers, by nature, tend to emphasize the airborne side of safety. But what about enlisted safety programs? Has an important potential for accident prevention been overlooked by assigning these programs a secondary role?

In VAW-125, we have attempted to emphasize enlisted safety. We initiate a new man's safety awareness by including, as part of his check-in, a chat with the safety officer. This is a good opportunity not only to welcome the newcomer, but to give him a brief rundown on the squadron's safety history, discuss how he will fit into our overall program, and review shipboard safety regulations and precautions. He is informed that he will receive detailed lectures from the squadron and shop safety petty officers who will indoctrinate him on flight deck and work center procedures. The lectures and discussions are backed up by a welcome aboard safety handout which includes the following information:

A. Squadron safety organization.
B. Emergency procedures:
   1. SSD (survival support device) operation.
   2. What to do in case of fire.
   3. GQ routes and stations.
   4. Man overboard.
   5. Collisions at sea.
C. Smoking regulations.
D. Flight deck safety and general safety tips concerning living aboard an aircraft carrier.

From the outset, the man is made aware that safety is very important in his new squadron. He is told how information is distributed and what he can do to contribute to the overall safety program. In short, the lines of communication are established.

The POD is strictly one-way communication, so we place special emphasis on a form we call "Hummer Mouse." As all of you quick-minded airdales have probably guessed, "Hummer Mouse" is an "Anymouse" form adapted for squadron use. I can't explain it, but I have been in squadrons that have had safety trouble sheets or safety gripe sheets, etc., and they all seem to turn brown in the bottom of a desk drawer. When was the last time you filled one out in your own squadron?

The "Hummer Mouse" forms and folders are conspicuously displayed in the readyroom, berthing compartment, and all shops. In addition to adding a little pa-zazz, *they are effective!* Whenever somebody spots a safety problem or malpractice, he fills out a "Hummer Mouse." The "Hummer Mouse" gets the *what, when, where,* and if appropriate, the *who* concerning any safety problems.

The next step is for the safety department to take action to correct the discrepancy. We get back to the individual who provided the information, unless he chooses to remain anonymous. But, in any event, a SITREP on "Hummer Mouse" is distributed approximately every month, depending on the tempo of operations. Everybody in the squadron can get a look at the status of certain action items. Admittedly, some of the problems cannot be corrected in a month, but at least the word is out that Safety is working on it and it hasn't fallen through the cracks. Therefore, credibility in the program is maintained.

The primary method of getting information to the shops is through a weekly newsletter called "Hummer House." (Yes, we are still searching for a better title.) "Hummer House" is always one page in length, so it fits nicely into the safety board frames we have in all shops. The format of the publication title changes each week, so a new issue is spotted easily (different colored paper could also be used).

During safety standdowns, we strive for equal time between the "Es" and "Os" schedules. An area in which the troops are sometimes overlooked is water survival. As part of a recent standdown, all enlisted men received an "in person" helo hoist lecture from a swimmer in the resident helicopter squadron. A chief with 13 years carrier experience said it was the first rescue lecture he ever had. We believe that the possibility of a man falling overboard or being blown over the side is as great as an aircrew bailout or ditching. Through rescue-at-sea education, all personnel will be better equipped to cope with this survival situation. Ostensibly, the lecture impresses them with the problems a

Sailor of the Quarter AD2 McPherson obtains another *"Hummer Mouse"* form.

helicopter crew encounters, and what a man in the water can do to help. Helo rescue has been incorporated into the squadron safety indoctrination for all new personnel.

Some of our troops truly fit into the "Sierra Hotel" category when it comes to safety. Their efforts are rewarded by giving special recognition in "Hummer House" to the "TORCHBEARER" who has made significant contributions during the month. In addition, as semiannual enlisted evaluations become due, the safety officer reviews his files and memory and writes a safety input for the man's evaluation.

AW2 Thompson of HS-11 demonstrates the proper helo hoist procedure to AT2 Mounts.

Obviously, no squadron has the panacea for all of Naval Air's safety ills, but we believe we are on the right track. To get some *action* in squadron safety programs, we offer the following for consideration:

1. Use the squadron check-in to good advantage. If a man's check-in is nothing more than quick initials on a sheet of paper, it is not surprising that he will not know the name of his safety officer during a safety survey.

2. Initiate some type of safety discrepancy reporting form. Call it "Hawk Hazards," "Tiger Troublesheet," "Guardsman Gotchas," etc., and make certain that the form is conspicuously displayed in all squadron spaces. If somebody mentions a safety problem, tell him to fill out one of the forms. (Word-of-mouth information sometimes gets garbled.) For significant safety saves of equipment or personal injury, publish a note in the POD and give the man recognition for his head-up work.

3. Recognize outstanding safety performance.

Remember, it is the day-to-day professionalism and good safety practices of our men which frequently save us from having to perform "heroics" in the air, attempting to get an aircraft home unscathed. The "Es" deserve much of the credit! ◄

NATOPS

By LCDR T. E. Corkern
HS-7

NATOPS, to the majority of us in the aviation community, is an omnipotent, omnipresent power that has always existed. We would no more question the need for a NATOPS program than we would question the need for aviation in the Navy. The concept and design of the program is to increase combat readiness and improve safety in piloted aircraft. Where does the three-toed sloth fit into all this? Mr. Webster defines sloth as: (1) "A disinclination to action or labor" and (2) "Any of several slow moving animals." Either of these definitions seems appropriate. Indeed, the three-toed sloth has been on the verge of extinction and, therefore, seems a more suitable candidate for our purpose. Specifically *(and taking considerable literary license),* the three-toed sloth has evolved along such specialized lines, he simply has not kept pace with his changing environment.

Has the NATOPS program become a three-toed sloth? The program hasn't been with us forever – only since the late fifties and early sixties. Old age shouldn't have had time to take its toll. To better answer the question, let's take a look at both the good and bad in the NATOPS program. On the positive side, we have taken the entire aviation community, which was operating on a rag tag menagerie of squadron SOPs and "by gosh" and "by gollies" (with variations from squadron to squadron), and standardized our procedures for the various model aircraft. This has allowed the smooth interchange of aircrews and aircraft within a community, with a minimum disruption of combat readiness. Of greater importance, it has been largely responsible for a major reduction in the aircraft accident rate since its inception. *No little feat* – and certainly no three-toed sloth here. Let's look further.

From inception, the program was designed as a user's program, meaning you and I manning the seats make the decisions on how to do it – not someone who's been flying a desk for the past few years. Great, but with this concept goes no little responsibility. OPNAVINST 3710.7F lays it right on the line: "Increased aircraft familiarity, changing operational requirements, and new developments will require continued updating of these publications. Necessarily, the users must accept the primary

CHANGE

A three-toed sloth?

responsibility in this regard." It goes on to say that if you and I see a conflict between NATOPS and other doctrine, we are " . . . obligated to propose a change."

As seasoned fleet aviators, we must look around and ask when was the last time we submitted a NATOPS change? Do I now detect a slight flaw in this bastion of naval aviation? Having been a squadron and CRAG NATOPS officer, I've had ample opportunity to expound on "If you don't agree with NATOPS, then submit a change – but until then, this is the way we do it." I've also had ample opportunity to ponder the usual response of "Yeah, sure, by the time the change is instituted, we will all be in contention for the Gray Eagle Award at the Tailhook/Rotorhead Rumble." Herein lies our problem.

I've yet to meet (and hope I never do) the naval aviator who, if you talked to him long enough, didn't strongly object to some procedure in NATOPS and felt he knew a better way to do it. This is precisely why the program was designed as a user's program, because in many cases, he does have a better way to do it. As with anything, we want to avoid change for change's sake. The administrative process of the NATOPS program is designed to prevent this, and it does so – all too well – I'm afraid. Remember, when you submit a NATOPS change, unless it has to do with personnel safety, potential danger to equipment, or emphasizes an operating technique or limitation, it will normally be classified as a routine change. Routine changes are retained by the model manager and presented as agenda items at the next conference. The vast majority of all changes are considered routine. Ah, the conference. Again, our governing OPNAV instruction points out that the effectiveness of the NATOPS program is largely dependent upon frequent review and updating of the manuals, and that the formal NATOPS review conference is the primary means of doing this. Depending on the number/importance of changes, these conferences may be scheduled anytime, but normally from 1 to 3 years apart.

Let's now back up and realistically take a look at the change process as viewed by the user. Let's assume I'm a first tour type and have been in the fleet for a year and a half, with one major deployment, and several in's and out's under my belt. I finally submit a NATOPS change on a certain procedure which has bugged me for the past year. Like the majority of all changes, it is submitted as a routine change and held for the next conference. Realizing the great variable here, let's arbitrarily assume this change just missed the last conference and is held for a year and a half until the next conference. Where is our intrepid aviator now? Ashore, possibly completely away from the community, flying a desk or maybe CIVLANT itself. (If so, I'm sure he is quite impressed with the progress his super idea has made.)

But that great day arrives, and representatives of the fleet convene for the conference. After several days, many heated debates, and not a few compromises, the conference is adjourned. Now the model manager and his representatives spend another week amassing the jumble of notes and compromises, making them readable for the printer.

From here, I must confess, we enter the realm of the bottomless pit. The process can become so involved in contractor obligations and printing priorities, etc. that you and I in the fleet have neither the time nor the inclination to follow its progress. The ultimate result of all this is that the worthwhile change submitted a year and a half ago may well take another year to year and a half before it appears in print. (Am I beginning to catch glimpses of a three-toed sloth in the making?)

The user concept of the NATOPS program is certainly valid. Overall, you and I can do much to boost the natural reluctance of our pilots to overcome inertia and submit those changes. We can also ensure (from within the community) that conferences are scheduled more frequently, if needed. However, here we seem to hit an administrative wall. I don't believe anyone can justify taking up to a year and a half to print something as important as a flight manual, and yet this seems to be the rule rather than the exception. I participated in both the CV and NWP-42 conferences (a common link, you might say), and they pretty well adhered to this time frame. Each activity/contractor involved in the final stages of printing and distributing manuals usually manages to explain away

his "small" part in the overall delay, and it is always "unfortunate" but equally "unavoidable." To the average fleet pilot (not having the big picture, of course), 3 years is an intolerable delay, and not at all in keeping with either the spirit or intent of the NATOPS program. We seem to have allowed the desk jockies into the driver's seat of our user's program.

I've pointed out a problem. What can we do about it? Certainly you and I in the fleet can ensure timely changes are submitted as we see the need for them. This, and ensuring timely scheduling of conferences, is about as far as we can go in improving the present program. What of the possible year and a half it's taking to print and distribute a manual? I am certainly not qualified to address the technical aspects of the printing/distribution process, nor can I address the assignment of priorities in this area. I can (as many of you certainly can) address the unfavorable impact it has on the NATOPS program and the fleet attitude toward it.

What can we do to overcome this bureaucratic jumble? I see several alternatives. The most obvious being to ensure that the printing of flight manuals is given a higher priority from the start.

Another possible solution is to incorporate a third category of change, ranking between Urgent and Routine, designating it a Priority change. This change could be evaluated by the model manager, who then makes his recommendation up the chain for final approval/disapproval. If approved, this procedure could be forwarded to the user by message, speedletter, or routine mail for immediate incorporation. The whole process could be effected within a certain time frame (say 30 days), reproduced locally (photo copy/ditto mat), and incorporated into the manuals as an interim change. This sounds too simple and too logical to work; however, a change recommending this is being submitted.

Another possible solution is to decentralize the administrative handling of the NATOPS program and allow the various wing commanders to become more directly involved in their respective aircraft NATOPS program. (I'll make points with this, I'm sure.) Even though the majority of all changes may not justify (by definition) being considered Urgent, from the user's standpoint, they are still important and shouldn't require 3 years to appear in the fleet. Placing the major responsibility for the program's administration on the wing level will at least ensure that the user has a competent audience that is knowledgeable in the aircraft and personally interested in the safe, effective utilization of the community's available assets.

So, a three-toed sloth? I certainly hope not, but we have a potential one in the making if we don't do something to control the self-perpetuating, administrative maze the program seems to be growing into. In the final analysis, you and I are the ones who sign for the bird and accept the mission. At that point, excessive baggage and administrative sloths are of no value to us. If they can't keep up with the pace, then they have outlived their usefulness to the fleet and should be discarded.

Take time now to review a program that directly regulates and, in some cases, restricts you in the performance of that mission. Let's apply the same professional aggressiveness with which we fly our aircraft to the NATOPS program, and get back down to fighting weight. ◄

Fire in No. 1

A C-1A was scheduled for a maintenance turnup. When the starter switch was pushed to start the port engine, the engine burst into flames. The director signaled an engine fire to the turnup crew, but the crew failed to see the signal.

The director switched to the cut-engine signal. The crew saw the signal and secured the engine. The NC-8 driver waited until the engine had been secured before he unplugged the power. The fire was extinguished with a single fire bottle, and investigation failed to disclose any damage.

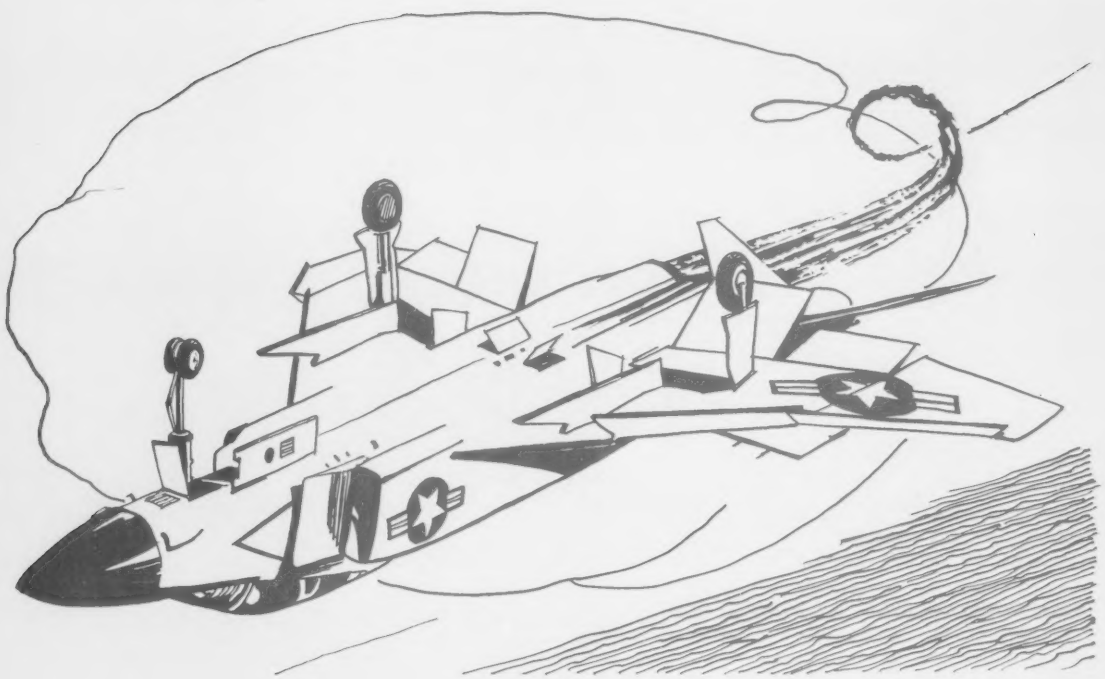
A look-see did reveal the cause of the fire. An improper installation of the starter conduit was the culprit. A lock washer had been placed against an insulator washer. Vibration caused the lock washer to cut through the insulation, causing the conduit to short out, resulting in the fire.

This could have been a catastrophe since, the night before, the same engine had experienced a major fuel leak during an out-of-check turnup. Had both failures occurred simultaneously, the results could have been wild!

No matter how routine a turnup may be, those involved must be alert and prepared for any eventuality. There is no room for complacency even during a turnup.

Now I'm a believer!

By Maj James S. Mosbey, USAF
VMFA-314 Exchange Pilot



"CAUTION, wake turbulence, landing DC-10."

How many times have you heard the tower issue this phrase while in the pattern at MCAS Yuma (a joint-use MCAS/civil airfield)? Generally, you look ahead, see the big heavy on rollout on the other runway, then return your attention to the problem at hand – namely, getting your own wheels on the concrete. Anyway, wake turbulence won't bother a big, ugly F-4. *Wrong!*

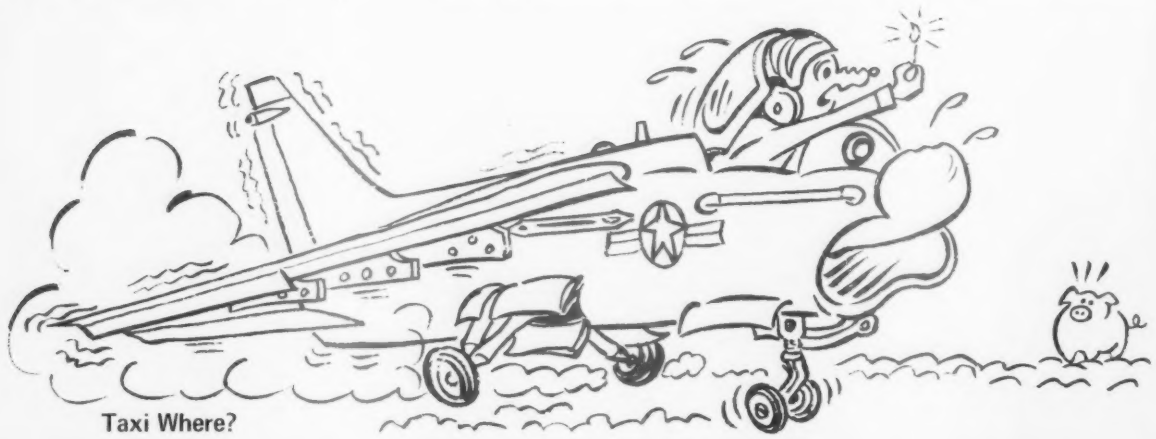
There I was . . . left turn to final when the DC-10 touched down on the right runway (we were cleared on the left). As I was rolling out wings level, the heavy was well down his own runway on the rollout. *Then* . . . have you ever looked at an orange grove through the top of your canopy from 200 feet? Judicious application of power, flight controls, and selected obscenities prevented a rather spectacular airshow on final from becoming a disaster. It also avoided planting a valuable combat resource (me, not the airplane) right in the middle of the fuel pits.

My interest in wake turbulence phenomena increased markedly after this incident. Did you know:

- Wingtip vortices are generated when wings generate lift. The more lift, the more vorts.
- These little twisters sink 500-1000 feet per minute.
- They move away from the generating wingtip at 15-20 mph in a no-wind condition. (That's how they get to adjacent runways.)
- A crosswind can move the upwind vortex over a downwind runway (double jeopardy).
- Mandatory tower time separation behind heavies is not required for VFR traffic.

To sum this up, heavies take up more air than is apparent, and the phrase "Caution, wake turbulence" means more than watching out for a few bumps on final approach.

Anymouse



Taxi Where?

I CALLED Ground Control, advised I was turning off the duty, and requested taxi instructions. Ground Control said, "Cleared to the line." I thought to myself, "That's great, but where do I go?" so I let him know I was unfamiliar with the field. His next transmission was "Rog. You're at the intersection of two taxiways now; take a slight jog to the right."

I followed the instructions and flipped on my taxi light to see where I was going, but there wasn't any joy. Somewhere between my initial takeoff and landing, the light went kaput. I didn't like taxiing in the blind, but had no other choice. I eased across a black void which I found out later was an unlighted, unused runway. I'm not quite sure what made me slow down, but it was one of those icy-hands-on-throat feelings. I was getting near the tower, but there wasn't any kind of surface lighting to give me a clue. I decided to stop, but my decision was about 5 seconds late. I rolled off the paved surface and stopped about 5 feet in the dirt.

As I keyed the mike to advise Ground Control, he called me and advised me to hold my position. (Whereinhell was he when I needed him?) I told him he was too late; I was in the dirt, had secured my engine, and one mainmount had sunk in the soft ground. Help arrived, and after inspecting the aircraft and being assured there wasn't any damage, they towed me out to a parking spot.

In retrospect, I was a dumb nut not to request a Follow-Me truck. Why it didn't occur to me to do so, I don't know. For sure, there won't be a next time.

The next day I really did a slow burn when I found out there had been several taxi incidents at that field in the same location. Why the station permits night operations even though the taxiway is unlighted beats me. Further, there was little consolation when I found out it's SOP to send a Follow-Me truck out at night to assist pilots who are unfamiliar with the field. The controller sure didn't offer me that service.

Lostonthefieldmouse

Embarrassing

WE were both qualified-in-model helicopter pilots and were flying a night, cross-country flight. The flight was scheduled to remain overnight, so we weren't in any kind of hurry. I was being given an instrument check.

Upon arrival at our destination, I had the checkpilot request a GCA. The approach was excellent, even if I say so myself. I took it right on down to minimums, saw the fuel gage read 190 pounds, and took a waveoff. I wanted to squeeze in a TACAN approach to complete that part of the check.

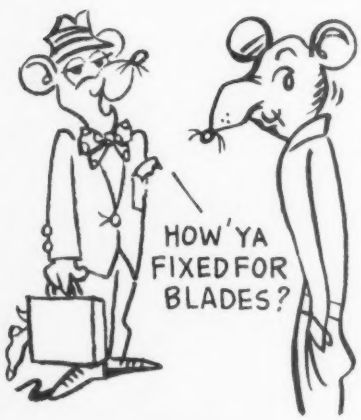
The purpose of Anymouse (anonymous) Reports is to help prevent or overcome dangerous situations. They are submitted by Naval and Marine Corps aviation personnel who have had hazardous or unsafe aviation experiences. These reports need not be signed. Self-mailing forms for writing Anymouse Reports are available in readyrooms and line shacks. All reports are considered for appropriate action.

REPORT AN INCIDENT
PREVENT AN ACCIDENT

We proceeded outbound, but I became concerned about the fuel state when the light didn't come on and the gage read only 100 pounds. I decided to reverse course and told the checkpilot I was shooting a modified straight-in. When the fuel gage reached 90 pounds, the 10-percent fuel and aft fuel boost warning lights illuminated. The old pucker factor really rose. I continued the approach and landed. A moment later while air taxiing to the parking area, the engine flamed out. While securing the aircraft, I noticed the gage read 30 pounds. I had never seen a gage read that low before.

Neither of us realized that there had been a malfunction of the 10-percent fuel caution light. I guess we both discounted the fuel quantity gage. (It had not been too reliable in the past.) Since our near-fiasco, the CO has decreed no flying with less than 200 pounds on the gage or after the 10-percent fuel light illuminates.

Onfumesmouse



Bad Preflight

ON arrival for a morning preflight of the duty H-46, I was told, "The aircraft is down – bad blade." The BIM indicator was then changed. The bad one was found to have been safety-wired backwards. It was presumed that it had backed out and given the bad indication. (QA disclaimed any responsibility, as do all of us who missed it on numerous preflights.)

The aircraft was turned up for a systems check and then shut down. Later that morning, two aircraft experienced unsafe nose gear problems while flying, and we were alerted to launch. We turned up, taxied to the runway, but were told the emergencies were resolved OK. However, the HAC desired to go ahead and get some flight time, but would stay in the pattern. One of our crewmen had been halfway through lunch when the horn went off, so I spoke up. The HAC returned to the pad and shut down. Postflight inspection by the crew chief disclosed the new indicator on the blade had popped again.

Thankfully, we found the bad blade from inspection, rather than flying the helicopter and using a complete crew as the indicator. I suppose that the lessons to be learned are that maintenance isn't perfect, and not to hasten to jump to conclusions. We should have assumed the worst and worked from there to resolve the discrepancy.

Suckedinmouse

Turn On Your Beacon

AT our base we have both rotary-wing and fixed-wing aircraft aboard. Normally, the stiff-wingers go to a nearby AFB for touch-and-go landings, but occasionally one will be found in the field pattern with the helicopters.

One night, there were three helos and a C-117 in the pattern. I found myself approaching the abeam position and was told I was No. 2 behind a C-117 turning base. I searched but couldn't see him until he was on short final. I thought my night vision was a mite slow in coming, so I didn't think about it again until I found myself behind him a second time at the same position.

I still had difficulty locating him and realized why. He only had his wing lights on – no rotating beacon. I called the tower and requested the C-117 turn on his beacon. The C-117 rogered the tower's request, but didn't turn it on. He left the bounce pattern to shoot a GCA to the same runway we were using for touch-and-go's.

Wouldn't you know the interval between us was inflexible? (I was always behind him.) Sure enough, for the third time I found myself No. 2 behind the C-117, still showing no beacon, so I decided to make a final landing.

I filled out an Op Hazard Report and gave it to the station ASO. I followed up the next day and was told the pilot was an O-5, and he had been advised of the report. Period. If he had been a junior pilot, I suspect he would have been read the riot act. Is safety for juniors *only?*

Curiousmouse

OPNAVINST 3710.7H says, "Anticollision lights shall be used at all times when the aircraft's engines are in operation . . . and landing/taxi lights are recommended during landing approach (both day and night) . . . when meteorological conditions permit." ◀

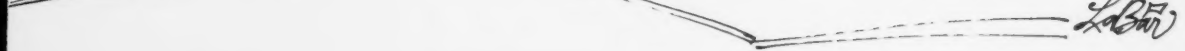
NONSTANDARD

By LT David P. Laskey
VF-111

LSO TERMINOLOGY

The following is a list of frequently used calls employed by LSOs. Realizing that understanding these calls is most difficult, the list below has been prepared so you will know what the LSO is *really* trying to tell you.

WHAT HE SEZ:	WHAT HE'D LIKE TO SAY:
"Roger ball."	OK, turkey, show me your best stuff. See if you can improve on your ramp strike last time out.
"Lookin' good."	This is actually a UHF check in preparation for power . . . power . . . POWER!
"Easy with it."	It's not necessary to move the throttle to the detent or the firewall on *each* correction.
"Just a little underpowered."	I hope you're ready for the rapid relight procedures.
"Don't go low."	You can't log a water landing unless you have pontoons.
"There ya go."	You're still FUBAR, but now you're at least within limits.
"Get it up there now."	Tell me on deck if that was a valid functional check of the red cell.
"Hold what you've got."	We lost the bubble for just a moment here. Don't worry; you're in no danger yet!
"Nice and easy, now."	Try to be smooth, you hamburger. I remember your last pass, and you started coming down like garbage off the fantail.
"Fly the ball."	OK, you're cleared to land. Stop counting the crossdeck pendants.



This article was written by LT Butler and sent to John Christiansen, Chief Pilot Military Flying, of Lockheed-California Company for comment and engineering data. We think the combination will be of interest. Mr. Christiansen's comments appear in color.

THREE-ENGINE FERRY CONSIDERATIONS

By LT Charles T. Butler
VP-31

SOME P-3 flightcrews can expect to fly missions from remote sites throughout the world, where maintenance support may be minimal to nonexistent. Therefore, the three-engine ferry becomes a real possibility for the P-3 flightcrew. In this discussion, I would like to provide a systematic approach to calculating necessary takeoff data, to provide a margin of safety during a three-engine ferry takeoff. Preflight data will be taken from available data in the NATOPS manual. Other data will be provided by Lockheed-California Company.

The P-3 NATOPS manual addresses the three-engine ferry takeoff and provides specific takeoff procedures. NATOPS says: "This is an abnormal operation and should only be considered when circumstances render other solutions impractical. Prior permission of the commanding officer is required for a three-engine ferry flight."

Since the NATOPS manual classifies this an abnormal operation, let's even the odds and pick an average day at a typical airport. Initial considerations: aircraft gross weight – 95,000 pounds . . . field elevation – sea level . . . runway length – 8000 feet . . . runway slope – none . . . winds – calm . . . OAT 75°F . . . power available at 80 knots – 4400 SHP . . . and the No. 1 prop removed.

All data should reflect the actual conditions, such as one prop removed and the second prop windmilling or feathered.

The NATOPS manual states: "Prior to takeoff, determine all necessary performance information from applicable data in Section XI." From Section XI, we can compute horsepower available at 80 knots, we can compute distance to liftoff, and to 50 feet – and that's it. There is no chart to calculate any type of refusal. How much runway do we need? If we enter the three-engine ferry takeoff distance to liftoff chart (Fig. 1) with the stated conditions, we can expect to use 5400 feet of runway to liftoff. We have 8000 feet of runway, so no problem. No problem unless we lose No. 2 engine during the roll. If we lose it at slow speed, we are well below Vmc_{ground}, and we can expect control difficulties until we reduce power, but we should be able to stop the aircraft.

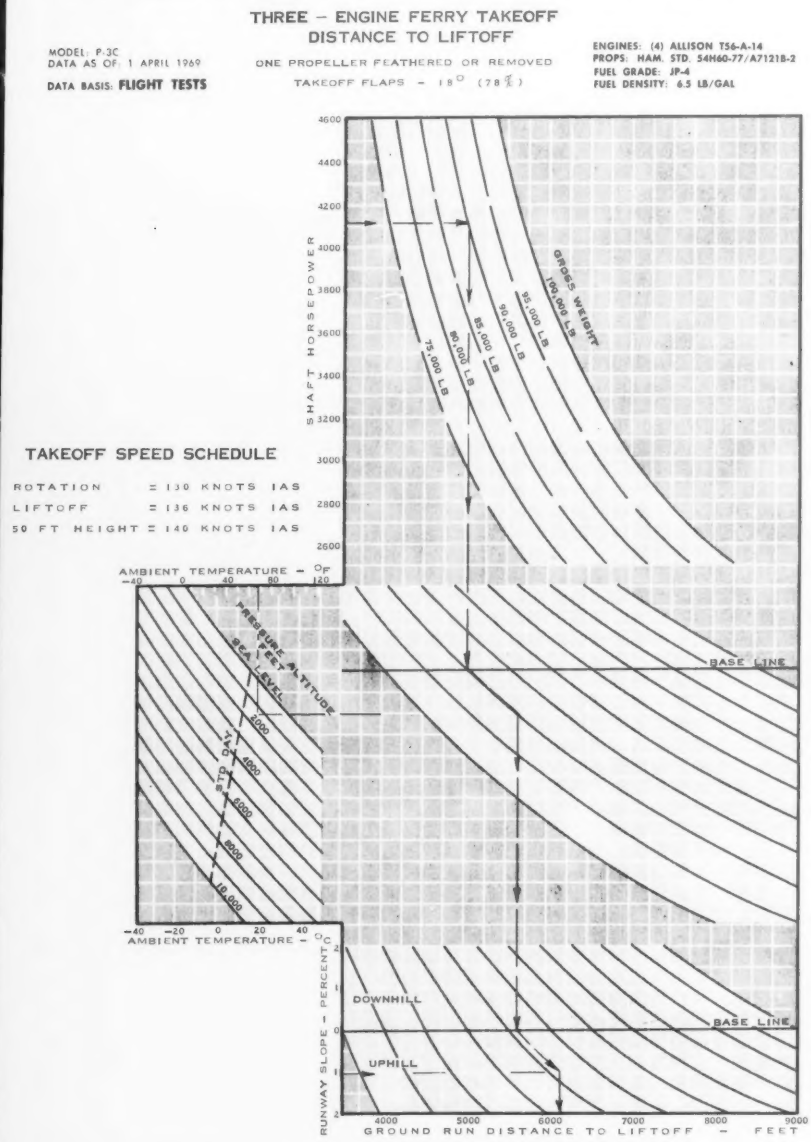


Fig. 1

Three-engine takeoff performance is predicated on the following pilot technique and conditions: dry runway for maximum tire coefficients; wind favorable, down the runway or crosswind to that side, improving directional control; acceleration to Vmc_{ground} (three engines, 102 knots) using the maximum available thrust from the third engine while maintaining directional control; V_{rot} at 130 knots accomplished smoothly while applying corrective controls for the initial zero-heading climbout; accelerate to optimum climb speed by maintaining 50 percent of available climb capability until on-speed.

The No. 1 prop removed presents the most critical condition. A calm wind doesn't help reduce the takeoff distance, and acceleration to V_{rot} with the No. 2 or No. 3 prop feathered or removed is substantially better.

Computing the P-3 three-engine capability using LT Butler's criteria comes out like this: accelerate to V_{rot} (130 knots) will take 5400 feet; Vmc_{ground} is 126 knots/Vmc_{air} is 130 knots; distance to stop from 130 KIAS, taking into account a number of variables is 5400 feet. It works out to the simple calculation, or rule of thumb, that runway needed to accelerate to a given speed is required to stop with two engines out on one side.

Continued

To attain the $Vmc_{air/ground}$ speeds as set forth in this discussion, correct control inputs by the pilot are required. This means that aileron and rudder are deflected in a coordinated manner to maintain a straight track. For instance, if the No. 1 prop is feathered, the aileron wheel angle at V_{rot}/V_{lof} should be deflected to the right approximately 90 degrees. (You should be able to see the white knuckles of your left hand directly in front of your face; opposite for No. 4 inop.) Rudder will be deflected in a coordinated manner as required. This eliminates any abrupt roll moment as the struts extend at V_{lof}. A low or mild roll moment might accompany V_{lof}, which can easily be controlled by additional control input. If the aileron wheel angle is essentially maintained at zero deflection at V_{lof}, the accompanied high roll moment will decrease controllability and increase the speed for Vmc_{air}.

Vmc_{ground} (two engines inoperative on one side) is 126 knots, which is the governing factor to determine the balanced field length. A second engine failure below 126 knots is normally a mandatory abort – if you have the balanced field length. For this, no less than 10,800 feet.

No P-3 pilot should attempt a three-engine takeoff unless he can stop safely from V_{rot}, or have a good understanding of the P-3 two-engine control and climb performance. Vmc_{air} is 128 knots and, at 95,000 pounds, the P-3 will have an initial climb rate of 500 fpm with an .04 percent gradient.

Simulated, two-engine stopping distances, as conducted for P-3 pilot training, do not simulate the actual conditions for the following reasons: feathered prop drag can't be simulated properly when the prop is turning at 1020 rpm, despite blade angle modulation by the power levers;

Situation 1. If we lose No. 2 engine at about 120 knots, we could try to continue to accelerate to 130 knots and rotate. However, will we be able to keep the aircraft on the runway with maximum power set on No. 3 and No. 4 engines, with No. 1 and No. 2 out? The P-3 pilots have no way of computing Vmc_{ground} with two engines out. Let's assume that we lost No. 2 engine just prior to 130 knots, and we keep the aircraft on the runway. If we continue the takeoff and rotate, we are now forcing the aircraft airborne with two engines – a real emergency! Can we control the aircraft once we're airborne? Vmc_{air} with *5-degree favorable bank angle* would be about 128 knots. Vmc_{air} is just 2 knots below rotate speed, based on perfect rotate technique by the pilots. In the heat of battle, if we rotate at 130 knots *wings level*, we will be well below Vmc_{air} (141 knots). Once airborne, the aircraft would probably commence a slow left-hand roll, and we would not be able to maintain directional control. Not so nice for any crew.

Situation 2. We could try to abort the takeoff at 130 knots. If we abort the takeoff by applying max reverse and braking action as soon as possible, how much runway will we use to stop the aircraft safely? Unfortunately, we do not have any charts available in the NATOPS manual to provide this information. In this example, if we had to use 5400 feet to accelerate to 130 knots, that leaves only 2600 feet (on an 8000-foot runway) to stop the aircraft. No way! Based on the actual data, Situation 2 results in the aircraft departing the end of the runway. Do you have the feeling of "damned if we do, damned if we don't"?

Just remember, the average 8000-foot runway does NOT provide adequate distance for a three-engine ferry takeoff.

During the takeoff roll, with either No. 1 or No. 4 out, the failure of a second engine would require some immediate decisions. Proper preflight planning and the application of correct pilot techniques can bring about a successful conclusion.

airflow over the wing is greatly influenced by the prop, which directly affects the braking torque capability (remains in undisturbed flow); runway directional control is directly affected by the large asymmetric drag conditions across the wing (worst case, two feathered on one side); hard braking at the maximum speed of 120 knots can't be achieved on the side where two are inoperative. The lift vector is still very effective on the inoperative engines' wing, which doesn't allow the required tire coefficient of friction. When excessive brake pressure creates a braking torque greater than the maximum possible rolling torque, the wheel decelerates to a slip condition, resulting in increased stopping distance or tire blowout.

Hard braking actions can't be accomplished immediately from a two-engine abort at 130 knots. Maximum safe initial braking speed is 120 knots – with judicious braking technique. If the P-3 had antiskid brakes and the pilot used hard braking under this condition, the system would dump pressure to a low initial level as a function of the coefficient of friction.

Further, hard braking (over 1000 psi) can't be achieved safely on the side of the inoperative engines until 80 knots (dry surface). The distance to stop using the many variables, including a 3-second recognition and action time, is about 4700 feet with a 10-knot headwind. So, if we are looking at an 8000-foot runway against the three-engine ferry balanced field length, it's a pure gamble.

If you happen to get yourself involved in a situation where you are tooling down an 8000-foot runway and incur a second engine failure at or near V_{rot}, you have only one choice – get airborne. You can't stop on the runway, but you can fly. The added distance to V_{lof} would only be 500-700 feet, and liftoff would be above Vmc_{air}, with a good, positive

climb rate. I'd rather take a two-engine capability which I know will take me around, than the certainty of running off the end to a no less certain loss of airframe. Better yet, don't ever be caught in this gambling situation.

The P-3 ground roll or landing performance chart (NATOPS, Figs. 11-30/31) should not be used as an abort chart, because of the different modes of the flight sequence. A landing aircraft is decelerating with land flaps and the power levers below 1000 shp per engine at touchdown, while the abort configuration is takeoff flaps and power. The charts also take in pilot recognition and action time, which are different for the two conditions, along with aerodynamic drag and prop influence.

There is certainly room to explain the three-engine ferry problems that exist, along with guidelines to supplement NATOPS Fig. 11-28. As in normal practices, when it comes to providing performance data, we set the basic example of standard conditions: sea level – standard day – 100,000 pounds (max three-engine takeoff weight)... zero wind... takeoff configuration – 18 degrees (78 percent)... 4600 TSHP... No. 1 prop feathered or removed...No. 2 or No. 4 engine failure at 130 knots... 3 seconds for recognition and action time.

If No. 4 engine failed at 130 knots, the two remaining operating engines being symmetrical would pose no control problem. Full reverse and moderate to full braking could be utilized. This condition would result in a complete stop in 3200-3500 feet.

If No. 2 engine failed at 130 knots, the remaining operating engines on the same side do present a directional control problem below 120 knots if full reverse were used. In this instance, full reverse should be used on No. 3 engine only, with No. 4 engine power

I admit this entire discussion is based on a hypothetical situation in which we lose an engine during a three-engine takeoff as we approach 130 knots. However, just as an aircraft that is overweight for existing runway conditions (Vd>Vref), we are placing the aircraft and crew in a situation in which the aircraft may not be controllable as a result of an engine loss.

Throughout this discussion we have assumed ideal conditions. The three-engine ferry takeoff distance to liftoff chart is based on a no-wind condition. What effect does a headwind have in computing the distance to liftoff? A headwind will help, and we can expect to use less runway to lift off. However, what would happen if we had a crosswind? Let's look at the worst situation, a crosswind from left to right. With No. 1 prop removed, we would find it very difficult to advance power on the No. 4 engine. In fact, we might never be able to provide full power on the No. 4 engine. This can only increase the runway required to lift off, but how much, we really can't compute. To counteract this variable, I recommend we use a two-engine ground rollout computation (5400 feet) as refusal distance. In this example, as the aircraft accelerates down the runway and has not reached 130 knots with 5400 feet remaining, the crew should abort the takeoff.

Preflight planning is necessary to carefully consider runway requirements prior to evaluating the feasibility of the takeoff roll. Until additional planning charts are available in the NATOPS manual, I recommend the information in this article be considered in computing necessary runway requirements. This will ensure a margin of safety in a very critical flight operation.

DITCHED but saved!

LIEUTENANT Commander R. B. Mordhorst and his crew from HS-2 launched in their SH-3 on a combination plane guard/ASW mission from USS ENTERPRISE. Five minutes later, the No. 1 engine produced a series of compressor stalls, and lost torque. Full throttle was selected, and fuel dumping began.

The copilot notified the tower of the emergency, and the HAC turned toward the ship. Although No. 2 engine was at full power, the rotor RPM drooped to 98 percent. They were flying at 250 feet, 60 knots, weighed about 20,000 pounds, and the OAT was 25°C. They were unable to remain airborne, and ditched.

The HAC made a soft water landing by drooping his turns to 90 percent to cushion the water entry. An integrity check was conducted and showed no airframe damage. The No. 1 engine was set at ground idle, and the crew lightened the helicopter by continuing to dump fuel and jettison all equipment which wasn't nailed down. Six minutes after landing, the crew tried a single-engine takeoff, but water had begun to intrude, and they were too heavy to fly. Number 2 engine then lost power (suspected salt ingestion), and they were committed to being a boat.

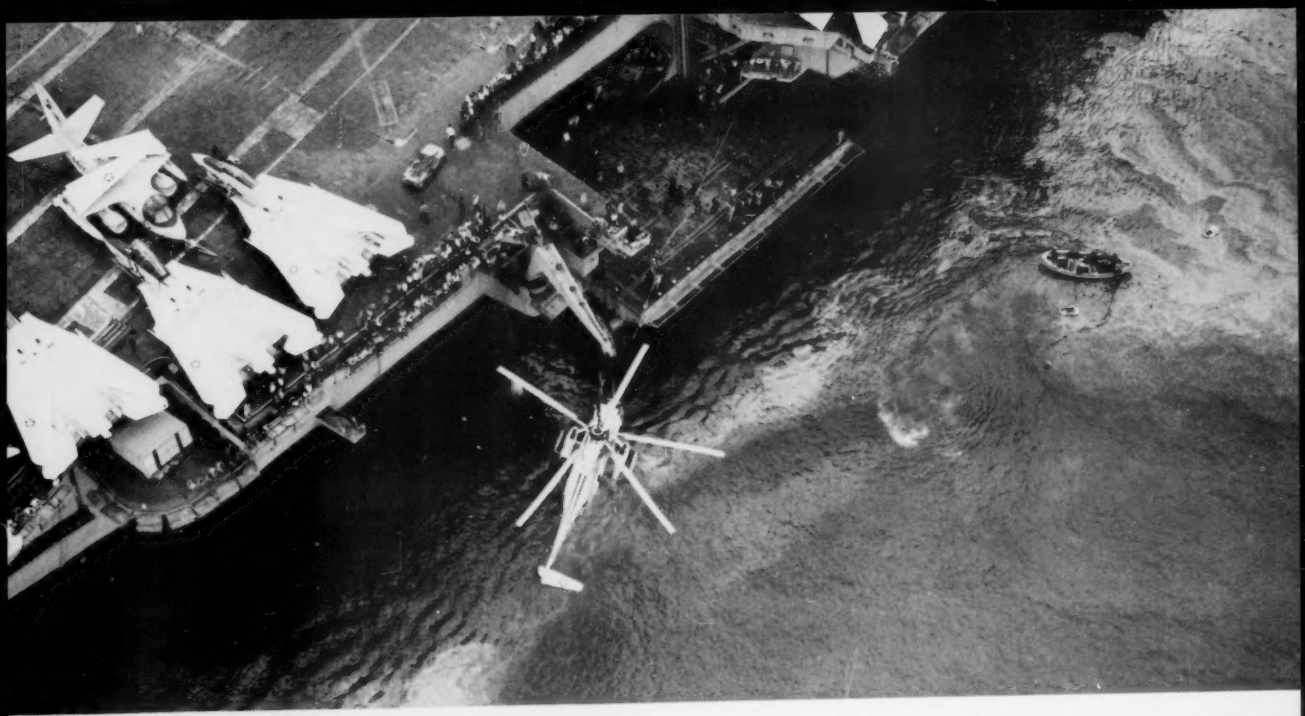
The aircraft was secured and, as the photos show, an outstanding job of recovering the helicopter was made by ENTERPRISE – in just over an hour!

lever modulated only as far as controllability will allow. For calculation purposes, we assume that no more than 50 percent of reverse thrust on No. 4 is used. A further assumption of 50 percent of maximum braking capability is made. This allows for the greater difficulty of control, including the greater tendency of the left wing to lift because of the relatively undisturbed flow on this panel.

For this condition, the distance from engine failure to a complete stop on the runway would be 5300 feet. Coincidentally, the distance to accelerate to 130 knots is 5300 feet; thus the total distance to accelerate and stop would be 10,600 feet. This would be the longest runway necessary for a safe three-engine takeoff under the limitations. Reducing weight or applying headwinds from NATOPS, Fig. 11-28, will reduce the runway required to V_{rot} (130 knots), but for all practical purposes and safety, the use of 5300 feet for the stopping distance should apply. If you are committed to an abort, retracting flaps will provide more effective braking action. This can provide up to a 10 percent reduction in rollout.

If an engine fails (two out on one side) at V_{lof}, it's obvious you are committed! The problem is somewhat critical, but you are above Vmc_{air} (128 knots), and you will have a climb rate of 500 fpm with gear down. Vmc_{air} is the ability to apply enough controls to maintain zero heading rate. The controls will be in a fairly satisfactory position for V_{lof} (No. 1 inoperative), so the second engine failure will not provide a serious roll moment. The lack of a favorable initial 5-degree bank angle does not constitute a loss of control, because while the low heading change rate is taking place, you can trade off your climb rate for airspeed. At this point, you are back on pg. 5-3 of the NATOPS. Remember, V_{rot} is 130 knots, V_{lof} becomes 136 knots, V_{50} is 140 knots, Vmc_{air} (two engines) is 128 knots, and the two-engine initial climb rate is 500 fpm – all favorable! So, when it comes to authorizing a three-engine ferry flight, make sure that available dry runway distance for abort is in front of the P-3 nosewheel at the critical Vmc_{ground} or V_{rot} speed point.

The data that has been discussed here does not take into account these factors: less than 100 percent specific engine thrust, field elevations above sea level, degraded runway conditions, runway slope, or crosswind effect. These variables can be produced into chart form after detailed study of P-3 flight test data and aerodynamic characteristics for the configuration.



724

724

GREMLINS 1977

GREMLINS still exist. My dad was in *Liberators* in big bang two, and he told me about them. For awhile, the little green critters who make it their profession to hassle, taunt, and tease fliers seemed to have disappeared. Well, they haven't. They are still around, and the Gremlins, like the aircraft of today, have become sophisticated and very up to date. The worst part is, I found out they're still around – at least in air wing strength – on April 1st.

Now, I enjoy an April Fool's prank as much as the next guy. But these particular Gremlins worked so subtly and planned their strategy so well that neither I nor the other instructor was aware of any one, sneaky move until it was too late.

To start at the beginning: Individual instrument training missions had been approved for the weekend. Our students were a pair of genuine ensigns (poor innocent babes then, now experienced beyond their years). The first hint of Gremlins at work came when the only *Skyhawks* available were configured with single centerline fuel tanks. The "double-bubble" birds were all mysteriously down.

As the AAR would have said, "Preflight, takeoff, and climbout were normal." Aircraft 303 was off first, with ENS Stick under the hood. I followed in 305 a few minutes later with ENS Scope.

At altitude, we met Weather Gremlin for the first – but not the last – time. Seems headwinds were 40-50 knots above forecast. (Not bad for a Gremlin. Years ago, all they

vintage

By LCDR R. R. Powell
VF-43

had to do was tear Mrs. Murphy's overalls off the clothesline to fake a pilot on the wind. Today they have to forge radiosondes, Mb prog charts, and some pretty scientific forecasting.) Well, that little bit of wind can't hurt, said I. I've flown this route lots of times. A quick recompute of the fuel figures (that's what ensigns are for) showed it would still be no sweat. However, just to be safe, I had my ensign refile to eliminate a dogleg, and while he was getting items on his syllabus flight checked off, had him make the duty check with Metro.

The weather-forecasting Gremlins must have been in the duty section. Destination weather was not panning out as forecast (2500 scattered). This was no real surprise, as the surface prog during the brief looked like a giant red and blue octopus had sprawled across the central U.S. Still, going from 2500 scattered to 700 broken was a step in the wrong direction.

"Center, 303 would like to go company frequency for one."

"Roger, 303, call back up."

"305 copies and switching."

"Five. Three. I've lost my TACAN and would like to have you join, in case I have any problems."

There was still a fair distance between the two aircraft, so 305 motored on, and 303 started getting vectors toward destination. The Gremlin that made 303's TACAN go "Tango-Uniform" must have held enroute because, a few minutes later, the azimuth and DME in 305 also failed!

Tell Center. Tell 303. Get serious about getting joined up as soon as possible. Start looking for someplace else to land. Can't find any place! They are all either too far, or the weather isn't any better than at destination. A check on the only field within range equipped with ADF/UHF revealed that it was down to GCA minimums. By now, the Gremlins are starting to chortle with unsuppressed glee.

Center does a good job of joining the flight . . . well, at least of getting them close together. Because now, that Gremlin so familiar to fighter pilots takes over – the one which enables you to spot ATC-called traffic at 20 miles, but prevents you from finding your wingman at 1½. It was embarrassing how long it took four sets of eyeballs to find each other, but finally we joined, with me as the wingie.

The flow of info from Center is really high. Vectors for enroute penetration to precision final; latest weather is worse than before, but still above circling minimums. So, I as wingman will land; leader (poor fellow) will go around visually. Tell Center we'll continue to our Navy destination. Air Force base weather to the north isn't any better. We'll stay with our own kind, thank you. The magic word still hasn't been said. It will be – soon.

The flight descends into the goo, and some obtuse Gremlin goes to work in ATC. Center passes on that, due to a full pattern, there will be a delay getting a radar approach. Let's see, two TACAN-less aircraft joined in miserable weather, less fuel than expected, and no place else to go. "Center, this is 303. We are declaring an *emergency!*"

The weather continues to deteriorate. Ceilings bounce between 100 and 500 feet, rain showers, turbulence. *Can't go anywhere else. No navaids. Only our radios. Radios! Why has there been so much silence? Call leader. Nothing. [Much frantic hand signaling and retuning.] Nothing. Try tactical. Take radio control into front cockpit.* "Five, how do ya' read?" "Loud and clear." *Whew!* Back to assigned frequency, and the radio stays good, except for some Gremlin sitting in the rear cockpit control box, making the gent in front do all the work.

It gets dark and gloomy as the flight descends. Speed brakes out, then in. Gears and flaps came down. So far, so good. *That* the duty Gremlins can't allow. So, one checked

out in physiology (probably the same one that deflects needles to miss veins during flight physicals) reaches in and grabs a handful of stapes, semicircular canals, otoliths, etc., and gives 'em a twist. Instant 60-degree angle-of-bank, and getting steeper by the second! *Talk to me, back seat. I know it's your first flight in the Fleet, and you haven't done this yet, but keep giving me our angle-of-bank! I've got vertigo, and this is no drill.*

The controller is good. Easy, steady voice. The pattern is ours. The field is ready. Arresting gear info, other runways, wingy to land, lead cleared visual downwind. Now, all we have to do is find the field.

The time between words starts to stretch. "303 is on glide slope." *My fuel is good.* "On centerline." *Winds gusty, but down the runway.* "303 is on glide slope approaching." *Where is the runway?* "Decision height." *The ground! I saw the ground!* "You are at decision height. If runway or . . ." *There – off to the left – the approach lights! Runway environment.*

Lead levels and starts to climb as I lock on to the runway, turn to centerline, level the wings, and touch down. Easy on the brakes. Couple of tentative slides – easily controlled. Only then does what is happening to the lead aircraft sink in. The ceiling and visibility are so low that 303 couldn't stay visual and has to go around for another GCA.

The field looks like a movie set for a Bela Lugosi flick. Fog and mist everywhere. I cleared the runway and just sat there. Didn't switch radio frequencies either. Our two aircraft had identical fuel states when we had started down. I read my gage and wished 303 a lot of luck.

The controllers were superb. After some thrashing, determining that a visual landing really wasn't possible, they started giving instructions. Of course, being controllers, once 303 was established downwind, they stopped talking for the allotted 1-minute coffee sip. "Radar, 303, you keep on talking! I want to know you're still down there."

Not exactly out of the book, but under the circumstances . . .

The GCA was relatively routine except for the blast of adrenalin each "above glide slope" call brought forth. Somehow, glide slope, aircraft, and clouds were all in the right place at the right time. A strange feeling to be on a parallel taxiway, knowing an aircraft was in the arresting gear on the adjacent runway yards away, and not be able to see him.

Historically, Gremlins have not been dangerous – just troublesome. On this April Fool's Day, it took a lot of ability and talent to keep their pranks from accumulating in a disaster. They did get the last word in, though. The rest of the weekend was routine and a lot more enjoyable. However, this is being written while SIQ with what is politely called a gastrointestinal disorder. A dozen oysters on the half-shell tasted delicious, but never give a Gremlin a chance.

P.S. The only place the Gremlins didn't infiltrate was the NAS Memphis radar room. The controllers did an outstanding job – kudos are in order. ◄

CUT ALONG THIS LINE

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The slogan, "Readiness through Safety," dates back to the origins of the Naval Safety Center. It has served us for many years, but perhaps our slogan is becoming obsolete. Safety does not always imply readiness, but it certainly contributes to it. In these times of reduced personnel and material resources, safety means dollars, equipment, and valuable man-hours saved. It means fewer injuries and deaths.

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STAPLE

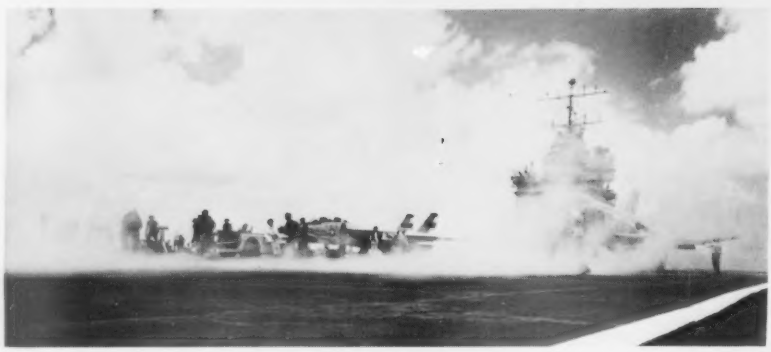
Letters

The Back Seat Goes First

NAS Miramar, San Diego – While reading the article on pg. 16 of the JAN '77 issue of APPROACH, I noticed that the drawing of the pilot ejecting from the aircraft was incorrect. In the TA-4J, as well as most two-seater aircraft that I know of, the aft seat will always be ejected first, no matter what position the eject selection switch is in. Even if the back seat is unmanned or safety-pinned, it still will be ejected first. The reason for this is that there is a good possibility of the aft pilot being burned if the front seat goes first.

Please keep up the fine work on your magazine.

AME2 Daniel P. Owen
VF-126



Re "Found Not Wanting"

Fort Rucker, AL – I'm a fling-wing driver in the Army, AH-1G rated, and enjoyed the article "Found Not Wanting" in the APR '77 issue, about the AH-1J's night engine failure.

We in the Army are still wanting when it comes to multiengine design for our birds. But even though you had twin engines on that snake, he still came down. Granted, 250 fpm is a whole lot better than a full-fledged 1000+ fpm autorotation, but I also see in your Bell birds the same bad habit our Bell crates have; namely, when a Bell rotor strikes anything from a bird to a boulder – transmission separation.

Fortunately, the powers that be have seen fit to buy us the new UTTAS, and we're still hoping that Bell's political machine doesn't stick it to us and convince those same "powers" that we really don't need the new AAH. When the Army finally gets with the program, probably in the mid- to late 1980's, and has a fleet of twin-engined birds – something the USAF and USN have had for years – then maybe we can be *real* pilots, too.

Capt Michael V. Stratton
United States Army

Left-Handed Thinking?

FPO, New York – At our remote location in Scotland, we look forward to receipt of APPROACH each month to keep the airdales up to par on the latest safety aspects of Naval Aviation.

We viewed the MAR '77 issue with great concern. As I said previously, many changes

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have taken place in aviation that we may not know about, but when did the Navy start launching aircraft from the fantail of carriers (rear cover).

LT J. M. Pokrywka
Officer in Charge
Naval Aviation Weapons Facility
Machrihanish, Scotland

FPO, New York – Re your back page of the MAR '77 issue of APPROACH. I have only been around a relatively short time, but I always thought the pointy part was at the other end of the ship. The S-3A is often launched downwind, but backing down and launching off the stern is a bit too much to ask of anyone. Our resident Marine officer wants to watch the recovery on the bow.

Your "undivided consideration" for the safety of others is welcomed, and we read your publication from cover to cover each month.

LCDR R. D. Fuller
Staff, CVW-3

FPO, New York – Is the picture on the back cover of the MAR '77 APPROACH a Murphy, or are the tail letters of the F-14 being photographed via a mirror?

AZ2 Joe Healey
VA-85 Data Analyst

● *Nolo contendere.*

Re "Shaky Descent"

NAS Norfolk – Your article "Shaky Descent" in the APR '77 issue of APPROACH was noted with particular interest. In 1969 and again in 1970, I experienced the same situation in C-118s. This appears to be a recurrence of a known problem, and as Grampaw Pettibone of *Naval Aviation News* might say, "Sufferin' catfish! This could have been prevented."

The last paragraph of that article states there was no known reason for the inflight separation; therefore, the following is suggested as contributing causes based on the 1969 and 1970 failures:

● Lack of blowout panels designed to tear out a small section of control surface instead of the entire unit when pressure builds to the blowout point.

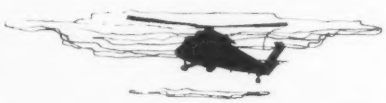
● There were no drain holes installed in the rudder fabric, which would also permit an equalization of pressure.

● Improperly installed skin rivets and the lack of rib stitching allowed the fabric to separate under normal stress, i.e., rivets with countersink heads were not countersunk.

● Both were test flights. One was an acceptance out of PAR. The other, to the best of my knowledge, was a routine periodic test flight some 6 months out of PAR. Both instances occurred during the first 3000 feet of descent at 250 KIAS. My theory is that in the absence of drain holes, the accumulation of liquid condensation lacking proper venting filled minute equalization pores and froze. On the way up, the rudder fabric expanded like a balloon, then ripped loose when commencing descent.

It is hoped that this information will shed some light on probable causes so remedial action may be taken to prevent a similar failure on any remaining aircraft with fabric control surfaces.

CAPT R. W. Smith, USNR
Naval Air Reserve Liaison Officer
COMNAVAIRLANT Staff



Re "Helicopter IFR Minimums"

Mobile, AL – Lieutenant Corkern brings out several points of interest to helicopter pilots in subject article in the JAN '77 APPROACH. He points out the seemingly apparent discrepancy between shooting automatic approaches to a hover over water and utilizing fixed-wing approach/landing minima ashore.

Helicopters are not required to operate entirely based on fixed-wing stall speeds and maneuvering criteria. TERPS (OPNAVINST 3722.16), para 1108, states that "When helicopters use instrument flight procedures designed for fixed-wing aircraft, approach Category A straight-in approach minima shall apply, regardless of helicopter weight." Further, FAR 97.3 (d-1) permits helicopters to use "one-half the published visibility minimum for Category A aircraft, but in no case may it be reduced to less than one-quarter mile or 1,200 feet RVR."

Based on this information, a helicopter pilot flying IFR may execute an instrument approach using Category A straight-in minima (even if he intends to land on another runway) with visibility reduced by one-half the published minima but no less than one-quarter mile. Of course, the MDA or DH will remain the same as for fixed-wing aircraft, but this is necessary in order to provide adequate obstruction clearance.

If the weather is below IFR minimums based on the above helicopter exemptions, I certainly would not want to be buzzing around "Special VFR."

LT J. H. Legwin, USCG
Aviation Training Center

Minimum Fuel Is Not an Emergency

NAS Patuxent River, MD – In your article "Fifteen Seconds from Disaster" (APR '77 APPROACH), it was implied that the controllers did not react properly by giving the T-39 normal handling. The Air Traffic Control Handbook, para 7110.65, states that "Use of the term 'minimum fuel' indicates recognition by a pilot that his fuel supply has reached a state where, upon reaching destination, he cannot accept any undue delay. This is not an emergency situation but merely an advisory that indicates an emergency situation is possible should any undue delay occur." Aircontrolmen define undue delay as placing the aircraft in holding, or issuing excessive radar vectors. If the pilot of the T-39 had wanted priority in his handling, he should have declared a low fuel emergency.

If the facts as presented in the article are accurate, it seems that the controllers involved reacted properly, considering the information passed to them by the pilots involved.

LTJG R. E. Frazier
Air Operations Department

● You are absolutely correct. What's more, in researching your question, we came to the conclusion that many Navy pilots share the T-39 pilot's misconception that requesting a minimum fuel GCA will result in a shortened pattern. This misconception probably stems from the Training Command, where pilots practiced "minimum fuel GCAs" consisting of abbreviated patterns, short turn-ins to final, and holding the gear until 30 seconds prior to final. What these approaches were simulating was a condition where only 5-10 minutes remained until fuel exhaustion. If you have only 5 minutes fuel remaining, you don't want a minimum fuel GCA, you want an "emergency low fuel GCA." *This* terminology has meaning to the controllers and will get you priority and a shortened pattern, if feasible. To sum up, "minimum fuel" and "minimum fuel GCA" mean only that no delay can be accepted. If you want priority handling, *you have to declare an emergency.* The Training Command was notified of this possible source of confusion, and they are looking into the terminology used on their practice GCA flights. ◄

approach

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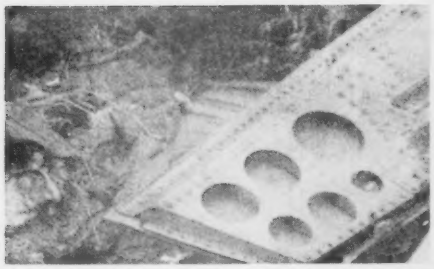

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Bravo Zulu

LTJG Robert G. DeMasters
VT-9

OF the many unsung heroes in naval aviation, perhaps no one is more unsung than the RDO (runway duty officer). But his job is important, and he can save lives and aircraft. Recently, LTJG DeMasters of VT-9 proved the value of having an alert, knowledgeable RDO on duty.

LTJG DeMasters routinely assumed his duties as RDO for the 1200-1600 shift on 23 March 1977. His watch was to prove anything but routine. A T-2C called abeam at 1354 for a full stop landing. LTJG DeMasters monitored the approach and witnessed the collapse of the starboard main landing gear on touchdown. He immediately broadcast "Get it in the air," and the instructor pilot took control of the *Buckeye* and complied. The instructor, believing he had blown a tire (based on tower's report of a "blown mainmount"), began preparations for an arrested landing and declared minimum fuel.

LTJG DeMasters, at this time, transmitted to the pilot and tower an accurate description of the nature and seriousness of the damage. The right MLG was trailing by two hydraulic lines. Simultaneously, LTJG DeMasters was notifying the squadron of the situation and eliciting appropriate advice via his auxiliary radio.

With the stricken aircraft orbiting overhead at emergency fuel (400 pounds remaining), LTJG DeMasters coolly and calmly relayed vital step-by-step procedural information to the pilot, 1st Lt W. M. Clark. LT Clark subsequently executed a flawless gear-up landing.

LTJG DeMasters' alert response in getting the aircraft airborne, and his calm, steady relaying of essential information in the critically short time available, were instrumental in the safe recovery of the damaged *Buckeye*. But for his quick, professional reaction, a valuable naval aircraft may have been lost and its crew placed in jeopardy.

LTJG DeMasters' vigilance and conscientiousness in performing the sometimes boring and routine duties of RDO certainly paid off here. Well done!

When you h ry through a preflight, yo ' e asking for it.

(What's missing?)

Idea submitted by LT Stephen J. Brown, VF-142, NAS Oceana, VA.